



# United States Department of the Interior

GEOLOGICAL SURVEY  
EROS Data Center  
Sioux Falls, South Dakota 57198

SPT  
E84-10017  
CR-174544

IN REPLY REFER TO OAB10-56

October 24, 1983

"Made available under NASA sponsorship  
in the interest of early and wide dis-  
semination of Earth Resources Survey  
Program information and without liability  
for any use made thereof."

## Memorandum

To: Technical Officer

From: Principal Investigator AW 31

Subject: Quarterly Report; Landsat 4 Investigations of Thematic Mapper and  
Multispectral Scanner Applications (PCN902-91548; S-10757-C).

### 1) Problems

The limiting problem remains data acquisition of our test sites on a timely basis. However, the plan to shift our effort to integration of retroactive TM orders into different application projects has worked well.

### 2) Accomplishments

An image map of Landsat-4 Thematic Mapper data of the Dyersburg, Tennessee Quadrangle was prepared under the direction of Richard A. McKinney of the Computer Services Branch. The cartographic value of Landsat's Multispectral Scanner (MSS) and Return Beam Vidicon (RBV) sensors have been thoroughly investigated for making image maps but until the coming of Thematic Mapper (TM) data, no evaluation of multispectral data within 30-meter resolution had been performed.

At the request of the USGS National Mapping Division (NMD) headquarters office, the EROS Data Center produced the 1:100,000 scale image map of Dyersburg, Tennessee using TM data. The image was geometrically corrected by resampling to 20-meter pixel resolution and cast on the Universal Transverse Mercator Projection. Negative transparencies were produced on the Lasar Beam Recorder with a linear look-up table, contrast stretched with equalized means, and an edge enhancement applied. NMD used the negatives to produce a lithographed image map.

Evaluation of color composites of various band combinations of TM data for visual interpretation of selected ground features is continuing. Data Production Branch personnel have produced five lookup tables for band combinations 1 and 2 and 5 and 7, and for individual bands 3, 4, and 6. These lookup tables are currently being used to produce black and white images of the seven TM bands from TIPS data. Six combinations of TM bands

(E84-10017) LANDSAT 4 INVESTIGATIONS OF  
THEMATIC MAPPER AND MULTISPECTRAL SCANNER  
APPLICATIONS Quarterly Report (EROS Data  
Center, Sioux Falls, S. Dak.) 3 p  
HC A02/MF A01

N84-11554

Unclas  
00017

CSCL 14B G3/43

ACCESS DENIED

have been selected for production of color composites of the Oklahoma City and Sacramento Valley images acquired through the TDRSS system and processed through TIPS. Prints at 1:250,000 scale are currently being produced and chips of selected features will be cut from them for visual interpretation evaluation. Applications scientists will rate band combinations for relative ease of interpretation of the features selected.

A poster exhibit was made of the Grand Canyon scene (P37R35) for the Geosat Committee meeting in Flagstaff, Arizona. Two subscenes were extracted and enlarged digitally three times. The data were then photographically enlarged two times for a total of five times. These scenes were then displayed with appropriate text explaining the Landsat TM system.

### 3) Significant Results

EROS Data Center application scientists evaluated the utility of Landsat Thematic Mapper (TM) data for natural resource assessment, emphasizing manual interpretation and digital classification of the data for U.S. Department of Interior applications. A substantial improvement was found in the information content of TM data when compared with Landsat Multispectral Scanner (MSS) data.

The improved spatial resolution of TM data aided in the location of roads, small stock ponds, and many other land features, permitting positive identification of landmarks. The improved spatial resolution of TM data also permitted more efficient manual interpretations of land use, better identification of resource types, and improved assessment of ecological status of natural vegetation. Improved spectral resolution of TM data provided a new source of information for natural resource assessment. TM band 5 and band 7 aided in defining water resources, wetland vegetation resources, and other important terrain features. The added information was useful for both manual interpretation and digital data classification of vegetation resources and land features.

Results from the analyses of both TM and TM Simulator data suggest that the coefficient of variation for major land cover types is less for TM data than for equivalent MSS data. This reduction in variance should contribute to an improved multispectral classification of land cover types. The TM bands 5 and 7 also add a new dimension to multispectral analysis, contributing new information about vegetation in natural ecosystems. Although the amount of new information in TM bands 5 and 7 is small, it is unique in that the same information cannot be derived from the Landsat MSS four-band spectral region.

### 4) Publications

Haas, R. H., and Waltz, F. A., 1983, Evaluation of thematic mapper data for natural resource assessment (abs.): in Pecora Symposium, 8th, Sioux Falls, South Dakota, 1983, Proceedings: (to be published).


Sadowski, F. G., Sturdevant, J. A., Anderson, W. H., Seevers, P. M., Feuquay, J. W., Balick, L. K., Waltz, F. A., and Lauer, D. T., 1983, Early results of investigations into Landsat 4 thematic mapper and multispectral scanner applications: in Landsat 4 Scientific Characterization Early Results Symposium, Greenbelt, Maryland, 1983, Proceedings: (in press).

5) Recommendations

The output of TIPS in digital tape format should be made available as quickly as possible.

6) Data Utility

The change from full scene data to quadrant data presents some problems as many test sites overlap two or more quadrants. It may be necessary to order a second quadrant depending on scene center accuracy.



Donald T. Lauer